

WHAT IS CLAIMED IS:

1. A pressure sensor for measuring a pressure
of a process fluid, comprising:
5 a vessel for receiving the process fluid;
 an electrode integral with an inner wall of
 the vessel; and
 a diaphragm that extends at least partially
 over the electrode and that is
10 configured to move relative to the
 electrode in response to the pressure
 of the process fluid;
 wherein an electrical capacitance between
 the electrode and the diaphragm is
15 related to a pressure of the process
 fluid.
2. The pressure sensor of claim 1 wherein the
 electrode extends partially around the
20 inner wall of the vessel.
3. The pressure sensor of claim 2 wherein the
 diaphragm extends partially around the
 inner wall of the vessel.
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4. The pressure sensor of claim 1 and further
 comprising:
 a temperature sensor integral with the
 inner wall to measure a fluid

temperature and to generate a
temperature signal indicative of the
fluid temperature.

- 5 5. The pressure sensor of claim 4 and further
 comprising:
 processing electronics adapted to produce a
 pressure signal that is a function of
 the temperature signal.
- 10 6. The pressure sensor of claim 1 wherein the
 electrode extends completely around
 the inner wall of the vessel.
- 15 7. The pressure sensor of claim 6 wherein the
 diaphragm extends completely around
 the inner wall of the vessel.
8. The pressure sensor of claim 1 and further
20 comprising:
 a measurement circuit adapted to produce a
 pressure signal based on electrical
 capacitance.
- 25 9. The pressure sensor of claim 1 and further
 comprising:
 a wireless transceiver mounted to the
 housing and electrically connected
 with the annular capacitor for

wireless transmitting the pressure signal to a control and/or monitoring system.

- 5 10. The pressure sensor of claim 1 wherein the
 electrode and the diaphragm form a
 first capacitor, and further
 comprising:
 a flow restrictive element extending from
10 the inner wall of the vessel into the
 process fluid;
 a second capacitor having a second
 electrode integral with the inner wall
 and a second diaphragm that extends at
15 least partially over the electrode and
 that is configured to move relative to
 the electrode in response to the
 pressure of the process fluid;
 wherein the flow restrictive element is
20 positioned between the first capacitor
 and the second capacitor to measure a
 first capacitance and a second
 capacitance such that a difference
 between the first and the second
25 capacitances is a differential
 capacitance representative of a
 differential pressure of the process
 fluid.

11. The pressure sensor of claim 1 wherein the diaphragm extends away from the inner wall into the process fluid.

5 12. The pressure sensor of claim 1 wherein the diaphragm is flush with the inner wall of the fluid flow conduit and the electrode is recessed into the inner wall.

10 13. A differential pressure sensor for measuring a differential pressure of a process fluid in a conduit, comprising:

15 a flow restriction element integral with an inner wall of the conduit and adapted to produce a pressure drop when placed in-line with a fluid flow;

20 a first capacitor integral with the inner wall of the conduit and positioned upstream from the flow restriction element and in-line with the process fluid; and

25 a second capacitor integral with the inner wall of the conduit and positioned downstream from the flow restriction element and in-line with the process fluid;

wherein in a first capacitance and a second capacitance are related to the pressure of the process fluid.

14. The differential pressure sensor of claim
13, further comprising:

5 processing electronics adapted to produce a
flow rate signal that is indicative of
a direction and a flow rate of the
process fluid as a function of the
first and the second capacitances.

10 15. The differential pressure sensor of claim
13, wherein the first capacitor and the second
capacitor each comprises:

an electrode integral with an inner wall of
the conduit; and

15 a diaphragm that extends at least partially
over the electrode and that is
configured to move relative to the
electrode in response to the pressure
of the process fluid;

20 wherein an electrical capacitance between
the electrode and the diaphragm is
related to the pressure of the process
fluid.

25 16. The differential pressure sensor of claim
13 wherein the flow restriction element has a narrow
fluid flow passageway extending between symmetric
first and second throat portions.

17. The differential pressure sensor of claim 13, further comprising:

5 a temperature sensor adapted to sense at least one of a temperature of the fluid flow and an operating temperature of the pressure sensor and to produce a temperature signal that is indicative of the sensed temperature.

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18. The differential pressure sensor of claim 17 wherein the flow rate signal is further a function of the temperature signal.

15 19. The differential pressure sensor of claim 13 wherein each of the first capacitor and the second capacitor extend at least partially around the inner wall of the conduit.

20 20. The differential pressure sensor of claim 13 wherein each of the first capacitor and the second capacitor extend entirely around the inner wall of the conduit.

25 21. A flow meter adapted to measure a pressure and a flow direction of a process fluid within a conduit the flow meter comprising:

a first capacitive pressure sensor adapted
to generate a first capacitance
signal;
a second capacitive pressure sensor adapted
5 to generate a second capacitance
signal; and
a flow restrictive element positioned
within the conduit and between the
first and the second capacitive
10 pressure sensors and adapted to cause
a pressure drop in the conduit;
wherein the first and the second
capacitance signals are representative
of a first and a second pressure of
15 the process fluid such that the first
and the second capacitance signals may
be subtracted to calculate a
differential capacitance
representative of a differential
20 pressure.

22. The flow meter of claim 21 wherein each
capacitive pressure sensor comprises:
an electrode integral to an inner wall of
25 the conduit; and
a diaphragm that extends at least partially
over the electrode and that is
configured to move relative to the

electrode in response to the pressure
of the process fluid;

wherein in an electrical capacitance
between the electrode and the
diaphragm is related to the pressure
of the process fluid.

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23. The flow meter of claim 22 wherein the
diaphragm is flush with the inner wall of the fluid
flow conduit and the electrode is recessed into the
wall.

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24. The flow meter of claim 22 wherein the
diaphragm extends into the process fluid and the
electrode is flush with the inner wall of the
conduit.

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25. The flow meter of claim 22 wherein the
electrode extends partially around the inner wall of
the conduit.

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26. The flow meter of claim 25 wherein the
diaphragm extends partially around the wall of the
conduit.

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27. The flow meter of claim 21 further
comprising:

a temperature sensor integral with the wall
to measure a fluid temperature and to

generate a temperature signal
indicative of the fluid temperature.

28. The flow meter of claim 27 further
5 comprising:

processing electronics adapted to produce a
pressure signal that is a function of
the temperature signal.

10 29. The flow meter of claim 22 wherein the
electrode extends completely around the inner wall of
the conduit.

30. The flow meter of claim 29 wherein the
15 diaphragm extends completely around the inner wall of
the conduit.

31. The flow meter of claim 22 further
comprising:

20 a measurement circuit adapted to produce a
pressure signal based on the
electrical capacitance.

32. The flow meter of claim 21 further
25 comprising:

a wireless transceiver mounted to the
conduit and electrically connected
with the first and second capacitive
pressure sensors for wireless

transmission of the differential pressure to a control and/or monitoring system.

5 33. The flow meter of claim 21 further comprising:

10 a temperature sensor embedded within an insulator of the first capacitive pressure sensor to measure a device temperature and to generate a temperature signal indicative of the device temperature.